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THE MAY MEETING OF THE MINNESOTA SECTION.

The regular meeting of the Minnesota Section was held at Macalester College, St. Paul, on Saturday, May 27th. There were thirty in attendance, including the following fifteen members of the association:

W. O. Beal, W. E. Brooke, W. H. Bussey, H. H. Dalaker, Gladys E. C. Gibbens, W. L. Hart, C. A. Herrick, Dunham Jackson, R. A. Johnson, W. H. Kirchner, A. Reuterdahl, F. J. Taylor, Ella A. M. Thorp, A. L. Underhill, H. B. Wilcox.

Dinner was served at 6:30 P.M. at the Women's Dormitory of Macalester College. At the business meeting, which came after the dinner, the following officers were elected: Chairman, Professor V. H. Wells, Carleton College; Secretary-Treasurer, Professor R. W. Brink, University of Minnesota; Members of the executive committee, Professor W. H. Kirchner, University of Minnesota; L. E. Lunn, Superintendent of Schools, Heron Lake, Minnesota. At the afternoon session the following papers were read and discussed:

(1) "Single parameter mixed groups of polar fields" by Professor V. H. Wells;

(2) "A short method of division" by Mr. Solomon Guttman, Minneapolis (by invitation);

(3) "Logarithmic tables of the 17th and 18th centuries" by Mr. W. D. Morgan, St. Paul (by invitation);

(4) "An analytic geometry treatment of the nature of conics generated by projective ranges and pencils" by Miss Elizabeth Carlson, University of Minnesota (by invitation);

(5) "Nomograms" by Professor R. W. Brink;

(6) "The Finite and Infinite, Space and Time" by Professor Arvid Reuterdahl.

Abstracts of the papers are given below, the numbers corresponding to the numbers in the list of titles:

1. Professor Wells gave a development of three single parameter systems of polar fields which lie between the pencil and the range of polar fields. The polars of a point envelop a conic or a fourth class curve and the poles of a line lie on a fourth order curve or on a conic.

2. Mr. Guttman presented a new arrangement of arithmetical long division in which the usual subtractions are turned into additions. This is done by making use of the arithmetical complement, defined as $(10^n - D)$, where D is the divisor and n the number of digits in the divisor. The chief advantage of the method consists in a check for accuracy which depends on the identity $A + Q(10^n - D) = Q \cdot 10^n + R$, A being the dividend, Q the quotient and R the remainder. *Example:* The compact form of the division of 48375 by 57, by this method, would be as follows:

$$\begin{array}{r|l} 57 & 48375 \\ 43 & 344 \\ & 172 \\ & 344 \\ \cline{2-2} & 84839 \end{array}$$

The quotient is 848 and the remainder is 39.

3. Mr. Morgan's paper concerned the history and construction of five of the earlier logarithmic tables, namely, Henry Briggs, *Arithmetica Logarithmica,* London, 1624; Adrian Vlacq, *Arithmetica Logarithmica,* Goudae, 1628; Briggs-Gellibrand, *Trigonometria Britannica,* Goudae, 1633;. Dodson, *Anti-Logarithmic Canon,* London, 1742, and Vega, *Thesaurus Logarithmorum,* Leipzig, 1794. Copies of each of these works which are now all entirely out of print and very scarce were exhibited at the meeting. The *Arithmetica Logarithmica* of Briggs and the *Trigonometria Britannica* are the only fourteen place tables ever published. The *Anti-Logarithmic Canon* is an eleven place table of anti-logarithms, the most extensive ever constructed. The *Arithmetica Logarithmica* of Vlacq and the *Thesaurus* of Vega are both ten place tables. The latter gives also the Wolframmi table of Naperian logarithms to forty-eight decimal places.

4. The nature of the conic generated by projective ranges and pencils, as determined by the projective relation involved in its generation, has been obtained by Steiner by the use of synthetic methods. In this paper Miss Carlson obtained the same and other results by the use of analytic geometry methods.

5. In his paper Professor Brink explained the purpose of nomograms and the method of using them. He exhibited nomograms for the solution of right triangles and other problems, and indicated their usefulness in teaching college mathematics.

6. Professor Reuterdahl discussed the significance of Space and Time for the Finite and Infinite of mathematics. Space and Time may be regarded as the cosmic background of all knowledge. The finite and infinite are inseparable by-products of Space-Time. As a dual cosmic principle, Space-Time is a dynamic totality. Time is the space-separator and space is the time-binder. The onward urge of time conveys the impression of incompleteness and thus time constitutes the dynamic element of the dual principle Space-Time. Time is like a shearing blade which dissects space. Time can shear space only in three distinct ways and therefore physical space is three dimensional. Spatial manifolds of higher dimensionality are merely conceptual spatial extensions. Space-Time constitutes the only true continuum in the cosmos. The study of the finite and the infinite, consequently, becomes an investigation of the nature of this dynamic continuum. The paradox of a process-infinite composed of continuously associated finite phases finds its solution in the dynamic continuum of Space-Time.

GLADYS GIBBENS, *Acting Secretary.*

A SIMPLE FORM OF DUHAMEL'S THEOREM AND SOME NEW APPLICATIONS.[1]

By H. J. ETTLINGER, University of Texas.

1. Introduction. It is an open question whether Duhamel's[2] theorem should be given to a beginning class in the calculus. That one can avoid the use of this

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[1] Read before the Mathematical Association of America, September, 1921.

[2] Duhamel, *Eléments de calcul infinitésimal,* Paris, 1856, p. 35.